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ABSTRACT

The handbook describes a method of teaching communication skills to students with severe disabilities (severely and profoundly retarded, trainable mentally retarded, autistic, deaf blind, and severely multihandicapped). In the interrupted behavior chain procedure, a routinized activity in a natural setting is interrupted and the child is taught to request an item needed to complete the activity. Successful performance is rewarded not only by the item requested but also by the opportunity to continue and complete the ongoing routine. After an introduction explaining the approach and the research supporting it, the next section focuses on classroom applications in discussions of: students for whom the strategy is appropriate, the targeted communication responses, selecting behavior chains and contexts for instruction, implementing behavior chain instruction, and monitoring progress. Appended are sample programs including objectives, task analyses, procedures, data sheets, and performance data. A list of 39 references is also included. (DB)

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Using the Interrupted Behavior Chain

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Using the Interrupted Behavior Chain Strategy to Teach Initial Communication Skills to Students with Severe Disabilities

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Using the Interrupted Behavior Chain

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INTRODUCTION

Teaching Communication Skills to Students with Severe Disabilities

Teaching students with severe disabilities* communication skills that allow them to express their wants and needs and carry on a social exchange with family and friends is a high priority educational goal. However, language intervention programs designed to increase the communicative competence of prelinguistic individuals have met with limited success. Although operant based teaching strategies have been used successfully to teach a variety of speech and language skills (see Goetz, Schuler, & Sailor, 1983), manual signing (Carr, Binkoff, Kologinsky, & Eddy, 1978; Carr & Kologinsky, 1983; Casey, 1978; Horner & Budd, 1985) and pictorial communication skills (LaVigna, 1977; Reichle & Brown, 1986), there are a significant number of students with severe disabilities who have failed to learn initial communication behaviors despite intervention efforts (Fay & Schuler, 1980; Guess, Sailor, & Baer, 1978) or are not generalizing newly acquired responses from instructional contexts to spontaneous use in natural settings (Guess, Keogh, & Sailor, 1978; Harris, 1975). The failure of behavioral technology to provide procedures that work

*Students labeled severely and profoundly retarded, severely handicapped, trainable mentally retarded, autistic, deaf-blind, and severely multihandicapped (Sailor & Guess, 1983).

effectively for these students prompted investigators to reexamine the components of the operant paradigm to determine ways of manipulating the traditional stimulus-response-reinforcement relationships in order to enhance motivation and, perhaps, increase the effectiveness of behavioral intervention programs in establishing generalized, functional communicative repertoires.

Typically, when operant procedures were used to teach initial communicative behaviors, correct responses were rewarded with a highly motivating reinforcer, yet one which often had no relevance or similarity to the communication response being taught. For example, the child who correctly touched a picture of a glass when requested "Show me drink" would be reinforced with an edible item unrelated to the correctly identified drink. This lack of specific correspondence between responses and consequences was targeted for investigation in a series of studies. Investigators attempted to determine whether functional communicative responses--responses that produced a consequence that was not only reinforcing, but also specific to the response (e.g., the child is given a drink if she touches the picture of the glass on her communication board)--would be more readily acquired than responses that resulted in a ubiquitous reinforcer not specifically related to the response.

Stafford, Sundberg, and Braam (1978) compared the acquisition of signed statements that were descriptive in nature

(i.e., they named a location pointed to by the instructor) with statements that were instrumental in producing a specific environmental event (i.e., they named the location of an object with which the student would then be allowed to play). The participant in the study was an 11-year-old boy with severe cognitive delay. Although the child was provided with a reinforcer for correctly signed descriptive statements, an analysis of his performance in the two conditions indicated that teaching communicative responses that were instrumental in producing specific environmental events facilitated learning.

Saunders and Sailor (1979) reported that receptive labeling skills were acquired more rapidly when a correct response resulted in the child being given the toy she named. These findings were replicated by Litt and Schreibman (1982). Koegel and Williams (1980) taught three autistic children a series of verbal, motor imitation, and receptive labeling responses. In the first condition, correct responses were reinforced with an item not specific to the responses being taught. In the second condition, the response taught led directly to reinforcement. The specific reinforcement condition showed more rapid learning.

The point to be made by this review of the specific reinforcement/ instrumental response literature is that there is evidence to suggest that the communicative responses acquired in the shortest time are those that produce a specific environmental outcome. Language function has recently been put

in center stage by the psycholinguists who view language development from a pragmatic perspective. Their approach is to look at language use and development in a social context. According to Bruner (1974), "Children learn language in order to socialize and direct the behavior of others." Their investigations have provided evidence that communicative behaviors that accomplish something for the child may be the first communicative responses learned. Bates, Camaioni, and Volterra (1975) did a longitudinal study of the development of preverbal communication skills in normal infants. They found that all subjects demonstrated two preverbal communicative functions: use of an adult to obtain an object and use of an object to obtain adult attention. Halliday (1975) analyzed a child's speech during the first two years, not in terms of grammatical structures, but in terms of the function the speech served for the child. Based on this type of analysis of the child's speech, he proposed seven functions that early utterances can accomplish. Among the first used were an "I want" function and a "you do" function. These findings suggest that the earliest communicative responses acquired are those that are used by the infant as tools to manipulate the environment. The results of functional analyses of early communicative behaviors, together with the recent research in communication instruction for severely disabled students, support the contention that selection of functional responses

(responses which result in a specific different environmental outcome for each different response being learned) for the initial communication skills taught may facilitate language acquisition.

Goetz, Schuler, and Sailor (1979; 1981; 1983) have offered a hypothesis of "functional competence" to account for the apparent impetus that instrumental communication responses provide for initial acquisition of communicative behaviors. They propose that "various actions which result in positive changes in the relationship between a person with severe disabilities and her environment will generate a motivational value that is additional to the value of the act as measured by the power of the immediate reinforcer generated by the act." (Sailor, Goetz, Anderson, Hunt, & Gee, 1987, p. 33). One source of motivation may be associated with the instrumental act itself rather than the specific event that is the product of the act. Specific reinforcement procedures enable the student to predict, as well as attain, specific desired outcomes. (See Sailor et al., 1987 for a discussion of theory and research related to the linkage of motivation and competence.)

Researchers in infant development are currently emphasizing intentionality associated with instrumental behaviors and its relationship to early communicative and cognitive development. It is their contention that the need to make predictions about environmental events and to test those predictions is a primary

impetus for the development of communicative behaviors. (Cf. Lewis, 1985; Schuler, 1987). The earliest intentional communication behaviors are displayed within highly routinized and predictable events (Bates, Camaioni, & Volterra, 1975; Bruner, 1975, 1978; Lock, 1978; Schuler, 1987). According to Schuler (1987), highly predictable routines "provide the basis for intentional communication, as the violation of anticipated occurrences provides the motivation to act in such a fashion that the anticipated sequence of events is restored" (p. 3).

Well-established sensorimotor routines may allow children functioning at a prerepresentational level (Piaget, 1951) to anticipate the steps in the chain of events in which they are participating and the reinforcement that may be associated with task completion. When routines are interrupted, the individual's predictions are violated, order is broken, and any reinforcement that is dependent upon task completion will not be forthcoming. The child is motivated at that point to act in some way to reestablish the routine. She signals an adult to request the item or event that is necessary to complete the behavior sequence.

Using an Interrupted Behavior Chain Strategy to Teach Initial Communication Skills

The effectiveness of highly routinized sequences of behavior to promote the development of intentional communication has been evidenced in language intervention programs for persons with

severe disabilities (Alwell, Hunt, Goetz, & Sailor, 1987; Goetz, Gee, & Sailor, 1985; Hall, Sundberg, & Stafford, 1979; Hunt, Goetz, Alwell, & Sailor, 1986). Ongoing routines were used as instructional contexts in an attempt to boost motivation and facilitate the acquisition of initial communication responses. The specific intervention, which has been called an "interrupted behavior chain strategy," requires that a typical instructional trial be inserted into the middle of an established sequence of behaviors in their natural contexts (such as getting food from a refrigerator, playing ball, or brushing teeth), rather than either presenting the training trial at the point of onset of the activity or in a massed trial format in simulated environments such as a classroom. The function of the communicative response being trained is to request either the item or the assistance that is necessary for completion of the routine.

Experimental analysis of the interrupted behavior chain strategy, albeit limited, has provided some evidence for the successful use of these procedures to teach initial communication skills to students with severe disabilities who have failed to learn when traditional procedures were used. The design for the Goetz et al. (1985) and Hunt et al. (1986) studies allowed for a direct comparison of the relative effectiveness of traditional instruction and interrupted behavior chain instruction. The instructional objective for

each study was to teach nonverbal students with severe disabilities to use a pictorial communication system (a communication board or book) to request items or events. When traditional instructional procedures were used, training was delivered just before the student began to perform the familiar chain of events. The instructor presented items that were associated with the activity (e.g., a ball for playing catch; a door for going out to recess; a glass of juice for drinking juice) and then used a standard correction procedure (modeling the correct response after an error) to teach the student to request the item which would, in turn, allow the activity to begin.

When interrupted behavior chain procedures were used, the instructional trial was presented after the child had begun to perform the activity. For example, the child might get the items needed to wash dishes, run the tap, and pour the soap before being interrupted. Once interrupted, identical instructional procedures were used to teach the child to request the item needed to perform the next step in the behavior chain. Successful performance by the student was not only rewarded with the item requested, but also with the opportunity to continue and complete the ongoing routine. The results for both studies showed that the interrupted behavior chain strategy was more effective than traditional instruction in teaching the requesting response.

It has been speculated that a major contributor to the effectiveness of the interrupted behavior chain strategy is the "motivational boost" that is provided when instruction is inserted into the midst of an ongoing, predictable sequence of behaviors (Goetz et al., 1985; Hunt et al., 1986). An interrupted routine context may provide the additional "boost" required for successful learning for some students; however, a recommendation to use the chain interruption strategy to teach initial communication responses can only be made if implementation of those procedures leads to the generalized and spontaneous use of the newly acquired responses. Only spontaneous and generalized communicative behaviors provide the learner with increased control and independence and allow for a normalized exchange with family, friends, and people in the community (Halle, 1987).

Teaching Spontaneous Communication in Natural Settings through Interrupted Behavior Chains

Hunt et al. (1986) and Alwell et al. (1987) demonstrated that communication responses acquired within an interrupted behavior chain context would generalize to a variety of natural settings where instruction had not been provided. Hunt et al. analyzed generalization in terms of the extent to which trained communicative function (requesting), response form (syntactic structure), and picture discrimination skills required for selection of the appropriate content for each communication

response were used within other behavior chain interruption contexts where no training had occurred.

Three students with severe disabilities were taught to use a communication board or book to request the item needed to complete a routine. Student 1 was required to point to the symbol "want" in his communication book followed by a point to the picture of the object desired from an array of four pictures. Student 2 was taught to look at three cards on a communication board (a line drawing of the target item, a blank card, and a partial drawing) and point to the target card to request the corresponding object or event. Student 3 was taught to make a request by pulling a card with the word "want" printed on it, which was attached by a key clip to the waistband of his pants, to above waist level.

Throughout baseline and intervention phases, generalization probes were conducted to determine whether the newly acquired responses would be used to request items within novel interrupted routine contexts.

The results demonstrated that for each of the three students the communication function (i.e., opening a communication book, touching the communication board, or grasping the "want" card to make a request), and the response form (e.g., touching "want" plus the appropriate item picture) acquired within one behavior chain context generalized without further instruction to at least two routines in which training had not yet occurred. The

student who had learned to make the request "want ball" by pointing to the appropriate cards in his book when interrupted during the game, also made the request "want juice" when interrupted as he approached the refrigerator without prior training of the juice response in the juice routine context. Moreover, for two of the students the picture discrimination skills required for selection of the appropriate content for each communication response generalized to nontraining contexts.

For this investigation generalization was analyzed in terms of the extent to which communicative behavior generalized to other situations where an ongoing sequence of behaviors had been interrupted and a communication response was required for reinstatement of the activity. It had been predicted that generalization to novel routines would occur, in part, because the stimuli controlling the response in one routine shared characteristics (e.g., interruption of a routine and a withheld item required to reestablish the behavior chain) with the controlling stimuli in other sequences. The overlap of stimulus characteristics in the interrupted chain and the extended contexts was expected to facilitate the transfer of stimulus control from the context where instruction occurred to novel settings (Horner, Bellamy, & Colvin, 1984).

To the extent that the student's use of responses acquired within an interrupted routine context was under the stimulus control of chain interruption itself--rather than discriminative

stimuli that would promote less restricted use of communicative behaviors (e.g., the presence of objects or events, the presence of a listener, contextual and interoceptive stimuli) (Halle, 1987)--generalized and spontaneous communication would occur only within interrupted behavior chains. If, however, the interruption of an ongoing event was not the primary discriminative stimulus for the requesting response, then generalization might extend to out-of-routine contexts (i.e., when a request is made for an object or event that allows initiation of, not continuation of, an activity).

Alwell et al. (1987) examined the degree to which responses acquired within interrupted behavior chains would generalize to out-of-routine contexts. Three elementary age children with severe disabilities were taught to request items needed for continuation of highly familiar routines. Student 1 was taught to use two signs and one natural gesture to request going outside, a hug, and a drink. Student 2 was provided with a "want" card attached to her pants or belt with a retractable key clip and was taught to pull it out to above waist level to request a toy, a drink, or food. A 4"x5" photograph album served as a communication book for Subject 3. When the book was opened, the photograph of the item to be requested was on one page with a photograph of a neutral item, which acted as a distractor, on the opposite page. The student was taught to point to the target photograph to request a drink, a toy, or a hug.

Interrupted behavior chain procedures were used to teach each of the target responses. Instruction occurred twice daily for each response at times when the routines naturally occurred. Settings, materials, and sometimes instructors were systematically varied to promote generalization of learned responses (Stokes & Baer, 1977). Generalization probes to out-of-routine contexts were implemented in three novel settings.

When interrupted behavior chain procedures were in effect, the instructor interrupted an ongoing sequence of events using one of the following strategies: delaying presentation of an item necessary for completion of the routine, placing a needed item just out of the child's reach, or preventing the student from lifting a needed item by holding it down. For the hug routine the instructor stepped back from the child, and for the going outside routine, the instructor prevented the child from going outside by placing a hand on his shoulder. No verbal cues were given. If the child requested the item associated with the next step in the behavior chain, he or she was given the needed item and allowed to complete the routine. If the child did not respond correctly, a correction procedure was used to teach the targeted response.

Generalization probes were conducted in a minimum of three out-of-routine situations for each communication response being taught. Although the students' schedule set the occasions for

the probes (e.g., snack time, recess, free play, etc.), the students themselves dictated their onset by indicating a desire, through a variety of nonverbal behaviors (e.g., gesturing, reaching, gazing), for an item that was in view, but out of the child's reach. The instructor approached or turned to the child and waited several seconds for her to request the item using the instructed response form. Probe trials thus approximated an incidental teaching format (Hart & Risley, 1968) in that the communication response preceded any interaction with the item or event.

The results of the study showed that each of the three students learned to request items needed for continuation of a chain of events using the targeted response form; furthermore, use of the newly acquired responses generalized to out-of-routine contexts where the student requested an item which allowed access to, rather than continuation of, an activity.

The experimental analyses of the effectiveness of interrupted behavior chain procedures have provided evidence that an interrupted routine is a powerful context for the instruction of initial communication skills for students with severe disabilities. As suggested by Goetz et al. (1985), inserting instruction into the midst of an ongoing sequence of behaviors may provide a motivational boost related to an interaction of active motoric responding associated with each

component of the operant chain and the reinforcement associated with successful task completion that is attained through the use of the instructed communication response, although interpretation of why chain interruption is effective awaits further research.

Investigations of the degree to which communication responses acquired within an interrupted routine context generalize to novel settings have shown that generalization occurs not only to other interrupted behavior chains, but also to out-of-routine contexts where the child makes a request in order to gain access to an item needed to begin, rather than continue, some activity. Further investigations are needed to analyze the effects of the procedure across students, responses, and settings; however, the results of studies completed to date offer promise of a powerful strategy for teaching spontaneous communicative behaviors to our most cognitively delayed students.

CLASSROOM APPLICATIONS

Students for Whom the Strategy is Appropriate

Interrupted behavior chain procedures have been used to teach initial communication responses (see the following section) to students with severe disabilities (including severe cognitive delay) who failed to learn when more traditional procedures were used (see p. 9 for a discussion of traditional versus interrupted chain instruction). For these individuals, the insertion of instruction into the middle of ongoing daily life routines appeared to provide the motivational boost that was needed for consistent correct responding.

The Targeted Communication Responses

Students have been taught to communicate verbally, or with sign, or with symbols in a communication book or on a communication board (Alwell et al., 1987; Goetz et al., 1985; Hunt et al., 1985; Hunt et al., 1986) using a variety of response forms which have included generic requests (i.e., presentation of a "want" card), requests for specific items or events (i.e., by identifying the item with a word, a sign, or a pictorial symbol), and requests requiring two and three word sentences (e.g., "Want milk."). Instructional goals achieved through interrupted behavior chain instruction have included the following: 1) increasing the frequency of self-initiated requesting; 2) increasing the number of contexts in which the students request assistance or missing/removed items; and 3) increasing the rate of use of a targeted response form.

It is crucial that a comprehensive communication assessment be completed to determine appropriate, individualized communication objectives before implementing a chain interruption strategy. Assessment of a student's communicative, cognitive, and speech and language functioning (cf. Schuler & Goetz 1981) is essential. Selection of instructional objectives appropriate for each individual student, whether it be to learn the communicative function of requesting, to acquire specific object labels, or to self-initiate verbalizations, is essential because the relatively few instructional trials in chain interruption allow limited opportunities for correction or practice. The potential for frustration is therefore high if the response is too difficult for the child to acquire.

Selecting Behavior Chains and Contexts for Instruction

Selection of behavior chains to be used as instructional contexts is based upon specific pretesting procedures. An initial pool of routines that occur consistently (at least once a day, four out of five days of the week) are identified by the classroom teacher. The routines can either be performed by the student spontaneously and independently (e.g., getting a drink of water or selecting and playing with a toy) or they can be an activity that is being taught through systematic instruction (e.g., pouring juice or brushing teeth) (Hunt et al., 1986;

Hunt, Goetz, Alwell, & Sailor, 1985). The criterion for selection of a behavior sequence is that there be a minimum of three steps in the behavior chain, and each step is at least initiated by the student (e.g., take coat off, open locker, hang up coat), even if he cannot perform the actual next behavior with complete independence, (e.g., the student might require assistance fitting the coat loop onto the hook in the locker). Once selected, the basic steps in the sequence are simply listed, much as might be done in a task analysis.

Each behavior chain is then evaluated on two dimensions: consistency of attempts to complete the chain when interrupted and the degree of distress shown. Selection of these dimensions is based on the assumption that persistence in task completion and emotional responses to the interruption serve as operational definitions of high motivation for task completion.

The instructor interrupts each chain at several predetermined steps. (See page 24 for chain interruption strategies.) She then scores whether or not the student tries to go ahead and finish the task (e.g., by reaching for the next item or moving in the next direction, etc.). The student's distress level is rated on a three-point scale, with one being low or no distress and three being high frustration as indicated by crying, tantruming, or self-abuse. Figure 1 (on the following page) presents an example of a behavior chain pretesting data sheet.

Figure 1

Evaluation of Behavior Chains

Student: Keuk

Behavior Chain: Getting coat/bag from locker

Date: 4-2

Date: 4-3

Date: 4-6

Evaluator: MA

Evaluator: MA/PH

Evaluator: MA

Sequence of Steps	In.Pt	Attempts	Distress			Attempts	Distress			Attempts	Distress		
		* to complete	1	2	3	to complete	1	2	3	to complete	1	2	3
			(Low)		(High)		(Low)		(High)		(Low)		(High)
1. locate key													
2. locate locker													
3. put coat/bag down													
4. insert key													
5. pull lock	*	yes	1			no	1			no		2	
6. turn													
7. remove lock													
8. open locker	*	yes	2			yes	2			yes		2	
9. put in/take out items; close locker													
10. replace lock													
11. return key													

Step 5: x distress: 1.3
attempts to complete 1/3

Step 8: x distress: 2
attempts to complete: 3/3

PAM.2/using.fig1

Each routine is observed and rated three times. The behavior chains selected for instructional contexts are those in which the student attempts to complete the task when interrupted for each of the pretest trials, and those in which the students average distress level is moderate (1.5-2.5). Extremely high distress (tantrums/self abuse) is ethically not desirable, while no distress and/or attempts to complete the task suggest that there is little motivation to complete the routine.

The specific interruption point within each selected behavior chain is also determined from the pretest evaluation data. A place within each routine where the student shows moderate distress and consistently attempts to complete the activity is selected as the place for interruption for training. In the example shown in Figure 1, the interruption would be targeted to occur just before step eight of the behavior chain, where distress was moderate and attempts to complete the chain were consistent. Once selected, the location of the interruption within each behavior chain remains constant.

Instructional settings. If generalized and spontaneous use of trained communication behaviors is the criterion for success when evaluating a student's progress, then instructional programs must be structured to promote the use of newly acquired responses across a wide range of conditions, persons, and settings. When using interrupted behavior chain procedures, the teacher can provide instruction on a targeted communication

response across several routines where the response is appropriate, and thus vary settings, materials, and instructors as much as possible. Routines selected for instruction may be behavior sequences that occur in the student's classroom, in nonclassroom school settings, such as the cafeteria, rest room, and school playground, and in nonschool settings, such as nearby stores and restaurants. Because routine interruption strategies utilize only naturally occurring materials, events, and communication opportunities, they can be applied throughout the student's instructional day, maximizing the infusion of communication across curriculum domains. The use of single or limited numbers of trials (see below) also facilitates use of this strategy in natural environments where massed practice of a skill might be inappropriate, or impossible, such as at a vocational training site.

Successful training outcomes have been achieved in a variety of nonclassroom settings including grocery stores, restaurants, vocational sites, school cafeterias, YMCA, library, domestic sites, and school playgrounds (Alwell et al., 1987; Hunt et al., 1985; Hunt et al., 1986). The instructional format in integrated settings remains the same: that is, ongoing routines are interrupted, and the student is taught communicative behaviors that allow for continuation of the activity; however, when planning training sessions in the community, keep in mind that procedures for interrupted behavior chain instruction

include termination of routines following an incorrect response on Trial 2. As a result, flexible scheduling and identification of alternative activities are needed when grocery shopping routines, restaurant routines, library routines, etc. are interrupted and ended.

Implementing Behavior Chain Instruction

The instructional trial for teaching the communication response is inserted into an ongoing routine. At the predetermined point in the behavior chain, the routine is interrupted. Interruption strategies that have been used include the following:

1. passively blocking the student from taking the next action;
2. delaying presentation of an item needed for completion of the action;
3. placing a needed item just out of the child's reach;
4. removing an item needed for the activity.

Natural obstacles have also been used, such as soda cans which the child could not open and closed doors.

In order to increase the degree of spontaneous and generalized use of the instructed communication response, verbal cues (e.g., "What do you want?") are discouraged. Generalization of responses which are under the stimulus control of an instructor's vocal behavior to noninstructional settings where verbal cues are not provided is unlikely (cf. Halle, 1987).

Trial 1. The instructor waits 5 seconds after interruption of the ongoing routine for the student to use the targeted communication response to request the needed item or assistance. If the student uses the instructed communication response, then he or she is socially reinforced and allowed access to the item or assistance needed to complete the behavior chain. If the student does not respond or responds incorrectly, the instructor models the correct response and/or manually guides the student through the response. No reinforcement is delivered and the student is not allowed to complete the routine.

Trial 2. The instructor waits 10" for the student to attempt again to continue the activity (e.g., by reaching for the item, moving toward the next location, etc.). The obstacle to continued activity remains in place (e.g., the door remains shut). If the student requests the item or assistance necessary to continue the routine after the correction, he is socially reinforced and given the item or assistance needed to reinstate and complete the activity.

If the student does not make the request using the trained response form after the first error correction, the instructor again models and/or manually guides the student through the response and then removes the materials or moves the student from the instructional setting, without allowing him to complete the routine.

Terminating the chain prior to completion may present classroom management problems. If, for example, the chain is one that the student does as part of a classroom job, someone else will have to complete the job, and the student will need an alternative activity to do. Training is discontinued if the student does not respond successfully and routines have been terminated for 5 instructional sessions. This guideline is suggested to avoid frustration and is based in part upon research suggesting that one characteristic of effective routines is the immediacy of the learning effect, typically within 2-4 trials. An evaluation is done of factors which may be contributing to the failure of the instructional program to promote the use of the targeted communication behaviors. Contributing factors may include any of the following:

1. low motivation for completing the interrupted routine (despite seeming appropriateness during pretesting);
2. requirements for performance of the communication response do not match the child's present skill level (e.g., visual discrimination skills for identification of appropriate symbols on a communication board; manual dexterity to produce signs; object permanence skills required to request missing item or to use a communication book that is out of view).

Time delay and prompt-fade strategies as options.

Alternative instructional methods to the two-trial correction procedures described above are time delay (cf. Halle, Marshall,

& Spradlin, 1979) and prompt-fade or antecedent procedures (cf. Ford & Mirenda, 1984). When time delay is used within an interrupted routine context, the instructor provides a prompt (e.g., modeling or physical guidance) to assist the student to request the item needed to reinstate the ongoing activity. The time between the presence of the desired item and the instructor's prompt is gradually increased beyond the expected response latency for the student who then begins to respond before the prompt is delivered. The Sample Programs section (p. 47) provides an example of time delay utilized within interrupted behavior chains.

When prompt-fade instructional procedures are used, assistance is provided, as in the first stage of time delay, immediately upon the presentation of the desired object; however, the transfer of the control of a correct response from the prompt to the presence of the object alone is not achieved through increasing delays in prompting but, instead, through a gradual reduction in the intensity of the prompt provided until the student is responding independently. The Sample Programs section also includes an example of the use of prompt-fade procedures for interrupted behavior chain instruction (see p. 41).

Monitoring Progress

Student progress towards the acquisition of targeted communication responses and the generalized use of those responses across contexts is monitored throughout the

communication training program using systematic data collection procedures.

Data collection. Instructional sessions consist of either a single trial (if the student responds correctly) or two trials (the second trial being implemented following an incorrect response on the first trial); therefore, possible response patterns during instructional sessions include the following:

<u>Trial 1</u>	<u>Trial 2</u>	<u>Consequence</u>
1) +	(not implemented)--	The student is provided with the item or the assistance need to complete the behavior chain.
2) -	+	-- The student is corrected after Trial 1 incorrect response; the student is provided with the item or the assistance needed to complete the behavior chain after Trial 2 correct response.
3) -	-	-- The student is corrected after Trial 1 incorrect response; the student is not able to complete the routine after Trial 2 incorrect response.

Figure 2 (on the following page) presents a sample data sheet for recording performance during instructional sessions.

Graphing procedures. Because interrupted behavior chain procedures utilize single or limited trials within the context

Figure 2

Data Sheet

Student EverettRoutine SnacktimeCommunication Response "I want ----- (food item)."

Date: 9/14		Date: 9/15		Date: 9/16		Date: 9/17		Date: 9/18		Date: 9/21	
* S #:		S #: 2		S #: 3		S #: 4		S #: 5		S #: 6	
* T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
-	-	-	+	-	-	-	+	+		+	

Date: 9/22		Date: 9/23		Date: 9/24		Date: 9/25		Date: 9/28		Date: 9/29	
S #: 7		S #: 8		S #: 9		S #: 10		S #: 11		S #: 12	
T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
-	+	+		+		+		+		+	

Date:		Date:		Date:		Date:		Date:		Date:	
S #:		S #:		S #:		S #:		S #:		S #:	
T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2

Date:		Date:		Date:		Date:		Date:		Date:	
S #:		S #:		S #:		S #:		S #:		S #:	
T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2

* S = training session

* T = trial

of ongoing activities, performance data is graphed as trial-by-trial cumulative correct responses. Figure 3 (on the following page) provides an example of a graph showing the number of cumulative correct requesting responses ("want _____ (item)") across three interrupted routine contexts. Only Trial 1 performance is graphed for each session. Flat trends in the graphed data indicate a lack of correct responses. Upward slopes reflect an increase in the number of correct responses. As is shown in Figure 3, the student did not respond correctly on any of the first four trials for the "I want food" response. On Trials 5 and 6 the student selected the appropriate symbols in his communication book for a total of 2 cumulative correct trials. On Trial 7 an error occurred which kept the total number of correct trials to 2. The students then responded correctly on the remaining trials as is reflected by the continuous upward slope of the graphed data.

Training of Response 2 ("I want water") and Response 3 ("I want record player") was begun later in time when the graphed data showed evidence of acquisition of the preceding response(s).

Generalization probes. Generalization probes should be conducted frequently throughout training to determine whether responses trained within interrupted routine contexts are generalizing to noninstructional settings. To implement a generalization probe within a novel interrupted routine context,

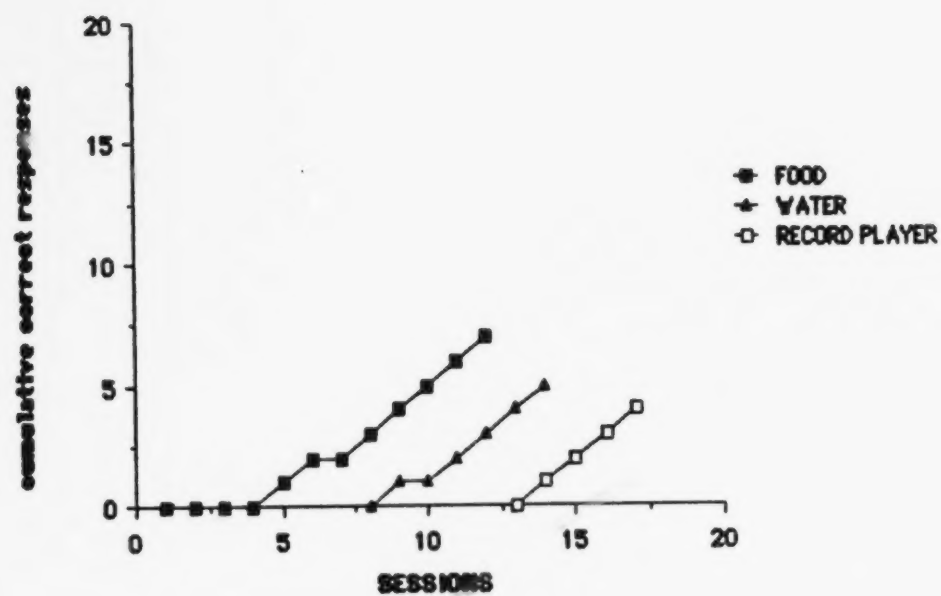


Figure 3. Graphing requesting responses ["Want _____(item)"] within interrupted routine contexts

interrupt the ongoing routine at a predetermined point and note whether or not the student uses the trained response to request the item or assistance needed to continue the activity (for example, if Nicky was taught to request food items during a snacktime routine, would he use his newly acquired requesting response when cafeteria or restaurant routines were interrupted). Utilize natural contingencies in the probe context by only providing the student with the desired item or assistance if he or she uses the targeted communication response. When implementing a generalization probe in out-of-routine contexts, allow the students to dictate the onset of a probe by indicating a desire through a variety of nonverbal behaviors (e.g., gesturing, reaching, gazing) for an item that is in view, but out of the child's reach. (See page 14 for a discussion of generalization to out-of-routine contexts.) Approach or turn to the child and wait several seconds for her to request the item using the trained response. Provide the student with the item or assistance only if he or she communicates successfully.

Figure 4 (on the following page) shows acquisition data for three communication responses trained within interrupted behavior chains as well as generalization probes to several out-of-routine settings. As is shown in Figure 4, David learned to request "drink," "out," and "hug" within the context of ongoing routines and then was able to use the newly acquired responses to make requests in out-of-routine contexts; that is,

pam.2
using.ch2

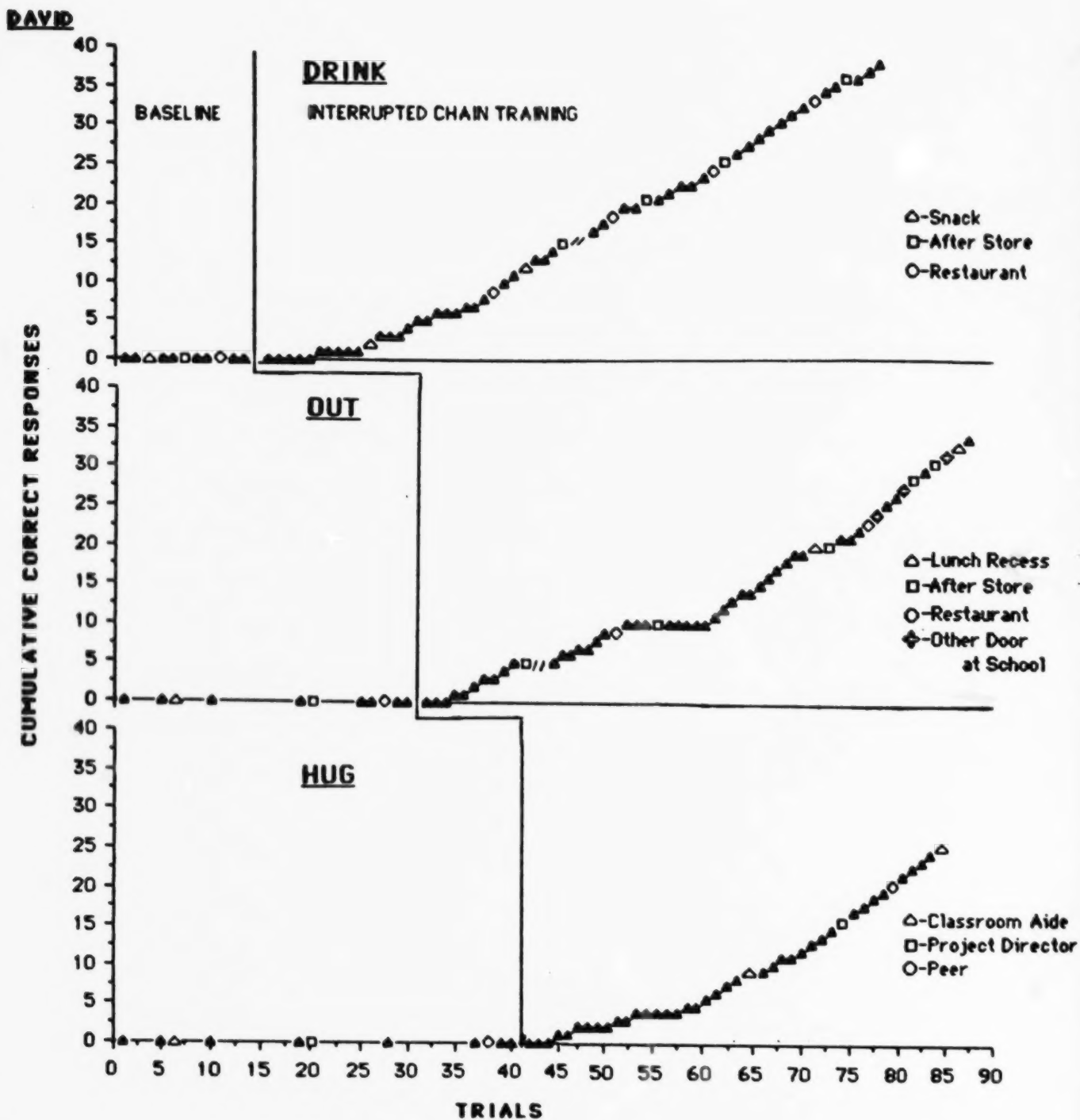


Figure 4. Acquisition of communication responses within interrupted behavior chains and generalization to out-of-routine contexts.

David would request a drink, going outside and a hug before the routine associated with drink, outside play, or hugging had begun.

Measurement procedures to evaluate interrupted behavior chain instruction should include not only acquisition data but also generalization probes to out-of-routine situations to insure that the students are using the trained responses both to request the continuation of an ongoing routine and to request an item before interaction with the item or participation in an activity has begun.

SAMPLE PROGRAMS: OBJECTIVES, TASK ANALYSES, PROCEDURES,
DATA SHEETS, AND PERFORMANCE DATA

Each of the three instructional programs which follows utilizes interrupted behavior chain procedures; however, each presents variations on the major theme: that is, different instructional strategies (as time delay and prompting) are used at the interruption point to teach the communication response, and program writing styles and data sheet formats vary.

Program 1: Interrupted Behavior Chain Strategy
with a Two-Trial Correction Procedure

Objective: Nicky will present his "want" card to request food at snack and lunch time, going out to recess, and his favorite indoor and outdoor games--for five of five sessions in each setting.

Student Does	Teacher Does
Nicky pulls his "want" card to waist height and presents it to the communication partner.	<u>Setting:</u> 1. Snacktime in classroom. 2. Lunch in the cafeteria. 3. Going out the classroom door for recess. 4. Ball games on the playground. 5. Toy play in the classroom. <u>Materials:</u> Data sheet, pencil <u>Procedure:</u> Interrupt the ongoing activities described above at the predetermined point. (See Routine Evaluation Sheet). <u>Trial 1:</u> If the S responds correctly, provide him with the item or assistance needed to complete the routine. If the S does not respond correctly, physically assist him to pull

Student Does	Teacher Does
	his card to waist height and present it to his partner; however, do not provide the item or assistance requested.
	<u>Trial 2.</u> Allow 10 seconds for the S to respond after the correction. If he uses the targeted communication response, provide him with the item or assistance needed to complete the routine. If he does not use the trained response, do not allow him to complete the activity at that time.
	<u>Generalization Probes to Out-of-Routine Contexts:</u>
	When the S indicates (e.g., with a gesture) a desire for an item or event associated with the settings listed above, use that opportunity, whenever possible, to implement an out-of-routine probe: follow the nonverbal request with a questioning look; provide the S with the item or assistance requested only if he uses his "want" card.

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Student Does

Teacher Does

Measurement: Mark a (+) for correct responses for Trial 1 and Trial 2. Mark a (-) for incorrect response. Graph the number of cumulative correct Trial 1 responses. Include generalization probe performance (+, -) on the graph.

Student Nicky

Routine SNACKTIME IN THE CLASSROOM

Date: 11/16	Date: 11/17	Date: 11/18	Date: 11/19	Date: 11/20	Date: 11/23
S #: 1	S #: 2	S #: 3	S #: 4	S #: 5	S #: 6
* T1	T2	T1	T2	T1	T2
—	—	—	+	+	+

PROBE

Date: 11/24	Date: 11/25	Date: 11/26	Date: 11/27	Date: 11/30	Date: 12/1
S #: 7	S #: 8	S #: 9	S #: 10	S #: 11	S #: 12
T1	T2	T1	T2	T1	T2
—	+	+	+	+	+

PROBE

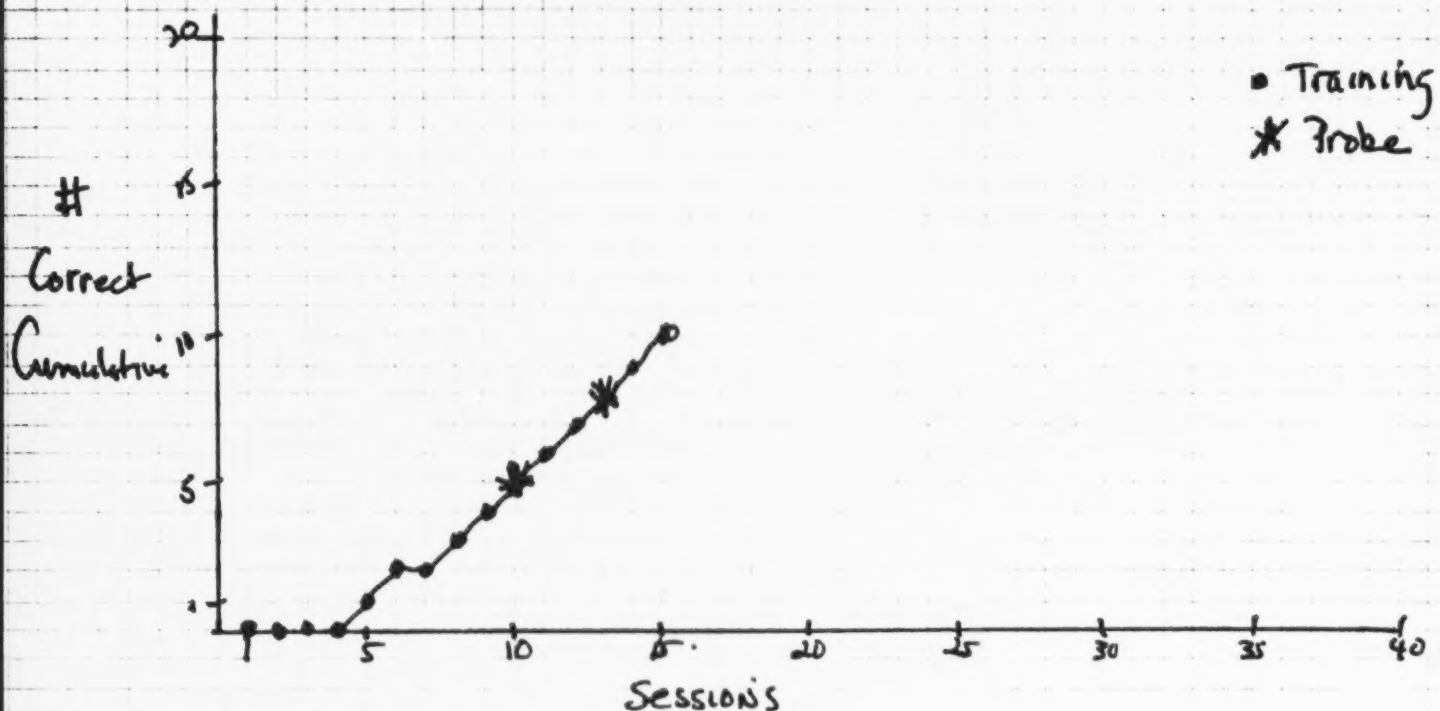
Date: 12/2	Date: 12/3	Date: 12/4	Date:	Date:	Date:
S #: 13	S #: 14	S #: 15	S #:	S #:	S #:
T1	T2	T1	T2	T1	T2
+	+	+			

Date:	Date:	Date:	Date:	Date:	Date:
S #:	S #:	S #:	S #:	S #:	S #:
T1	T2	T1	T2	T1	T2

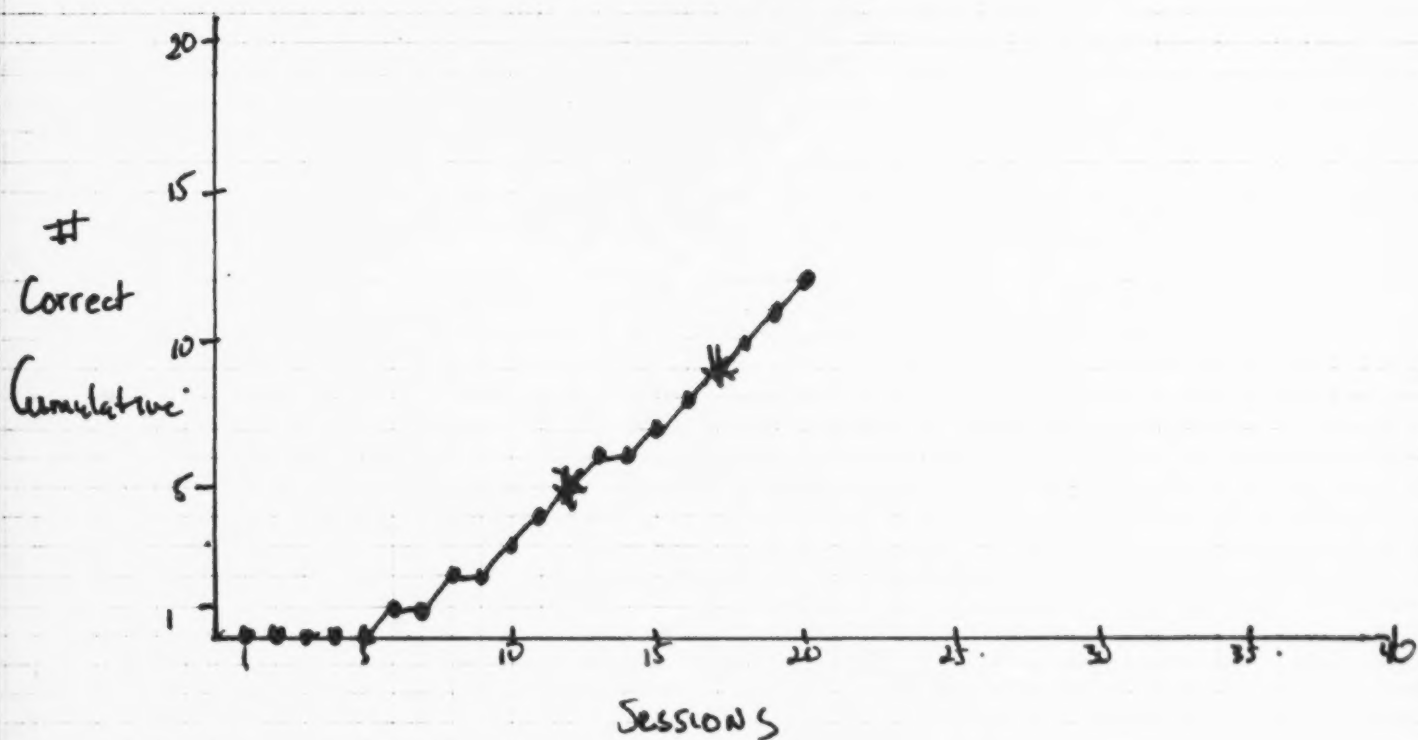
* S + training session

* T + Trial

SNACKTIME in the CLASSROOM



LUNCH in the CAFETERIA



**Program 2: Interrupted Behavior Chain Strategy
with a Prompt-Fade Procedure**

Using the Interrupted Behavior Chain

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Objective: When presented with 3 cards, two of which are blank, and asked, "Which one do you want?," Diane will independently pick up the pictured card that corresponds to the desired object at least 75% of the time daily on 3 consecutive days.

Setting: This program will be run:

1. In the classroom before lunch when she gets her dollar for the food line.
2. At the store next to the laundromat when she buys potato chips while waiting for the clothes to wash.
3. In the classroom and the church during meal preparation when she works with cups and plates (two separate items).

Materials: Data sheet, pencil, 4 items (dollar, chips, cup and plate), 4 cards with pictures of the items, two blank cards and card holder (adaptation especially to be used at the store).

Procedure: This will be a prompt fade and an object proximity fade strategy. Diane will pick up the picture of a desired object from three cards, two of which are blank, and placed in randomized locations.

- prompt fade:
1. full physical
 2. light physical
 3. tap cue to hand
 4. independent

- object fade:
1. object 1 inch from card
 2. object 4 in. from card

Objective: When presented with 3 cards, two of which are blank, and asked, "Which one do you want?," Diane will independently pick up the pictured card that corresponds to the desired object at least 75% of the time daily on 3 consecutive days.

Setting: This program will be run within the following routine:

1. In the classroom before lunch when she gets her dollar for the food line.
2. At the store next to the laundromat when she buys potato chips while waiting for the clothes to wash.
3. In the classroom and the church during meal preparation when she works with cups and plates (two separate items).

Materials: Data sheet, pencil, 4 items (dollar, chips, cup and plate), 4 cards with pictures of the items, two blank cards and card holder (adaptation especially to be used at the store).

Procedure: This will be a prompt fade and an object proximity fade strategy. Interrupt the ongoing activity(ies) as described (see routine evaluation sheet). Diane will pick up the picture of a desired object from three cards, two of which are blank, and placed in randomized locations.

- prompt fade:
1. full physical
 2. light physical
 3. tap cue to hand
 4. independent

- object fade:
1. object 1 inch from card
 2. object 4 in. from card

Using the Interrupted Behavior Chain

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3. object 7 in. from card

4. object in natural location

Correction: Wait up to 15 seconds for response. If no or incorrect response, Diane does not get the item. (If this is her lunch money she does not get to hold it until she approaches the ticket lady.)

Reinforcement: When she picks up the correct card immediately smile, praise and give her the item.

Measurement: + for picking the correct card.

- for no/incorrect response.

The number of trials will vary daily. The item used will be recorded on the data sheet but they will be graphed together daily. The graph will show percent (the number of +'s over the number of trials).

Criterion: Diane will change prompt levels when she gets 75% correct on 2 consecutive days. Begin "object fade" when she is independently picking up the correct card.

If she gets below 75% on 3 consecutive days, review data and consider change.

- items may vary in motivational levels.
- may need another prompt level or slower object fade.

Generalization: This program will be run by at least 3 staff members at 3 different sites. Also, four different items are to be used to teach the communicative function of request object.

(program contributed by Maureen P. Kennedy)

Date Sheet/Diane Communication

Put down 3 cards > 2 blank, 1 with picture of desired object.

See object location and Prompt level below.

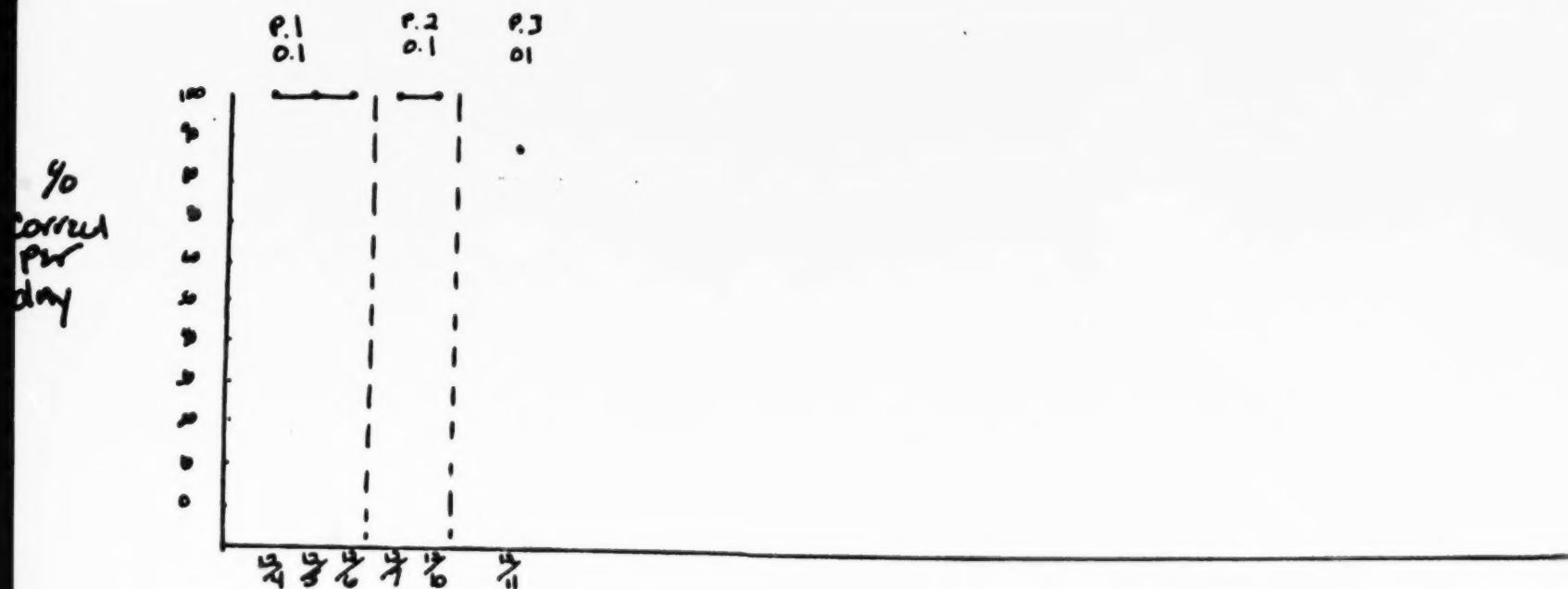
If correct give +; smile, praise & item

If no response mark - and repeat. if +

If no response or incorrect (-) no item - -

object location	Prompt level	item	Date	Location of Picture	+/-
item 1 in from picture card	give Done Full Physical	Cup	12/4	L	++
		plate		R	+
		Cup		M	+
		plate		R	+
		Cup		L	+
		Cup	12/5	M	+
		Cup		R	++
		plate		L	++
		Cup	12/6	M	++
		Cup		L	++
		Cup		M	+
		plate		R	++
		plate	12/7	M	+
		Cup		L	++
		plate		M	+
Move on	LF	Cup	12/10	R	+
		Cup		R	+
		plate		L	+
		Cup	12/11	L	-
		plate		M	++
		plate		R	+
		Cup		M	+
		Chips		R	++
		Chips		L	+
Move on	TAP				

Dane-Communication



P = Prompt level

- 1 Full Physical
- 2 light physical
- 3 tap us to hand
- 4 independent

O = Object level

- 1 1" from card
- 2 4" "
- 3 7" "
- 4 object in natural location

**Program 3: Interrupted Behavior Chain Strategy
with Time Delay**

Objective: Eddie will touch "want" and the picture of the item desired (from an array of 4 pictures) to request food or drink at snacktime or in the school cafeteria, a food or drink item in the grocery store, and the arcade game or tape recorder during leisure time in the classroom--for 4 out of 5 sessions in each setting.

Setting:

1. Snacktime (food or drink item)
2. School cafeteria (food or drink item)
3. Leisure time in the classroom (video game or recorder)

Procedure: Interrupt the ongoing activities described above at the predetermined point. (See routine evaluation).

Utilize a time delay strategy to teach the targeted response: that is, provide a prompt to assist the student to request the item needed to reinstate the interrupted routine. Fade the prompt by increasing the interval in 1 second increments between the presence of the object desired and your assistance.

Prompt: Point to "want" and then to the picture of the item desired

Delay increments: 0', 1', 2', 3' . . .

Correct response: 1) touches "want" (item) following a prompt (prompted correct responses)
2) touches "want" (item) before prompt is provided (anticipated correct responses)

Criterion for movement to next delay increment: 3/3 correct responses.

Criterion for exit from program: 5/5 correct responses performed before the prompt is delivered.

If the student responds correctly, provide him with the item requested. If the student does not respond correctly, do not allow him to complete the activity at that time.

Generalization Probes to Out-of-Routine Contexts: When the S indicates (e.g., with a gesture) a desire for an item or event associated with the settings listed above, use that opportunity, whenever possible, to implement an out-of-routine probe: follow the nonverbal request with a questioning look; provide the S with the item or assistance requested only if he uses his "want" card.

Measurement: Mark a (+) for a correct response following a prompt. Mark a (Δ) for a correct response before the prompt is delivered. Mark a (-) for an incorrect response. Graph the number of cumulative correct (+) responses (both prompted and anticipated correct responses). In addition, graph separately the number of correct (Δ) responses.

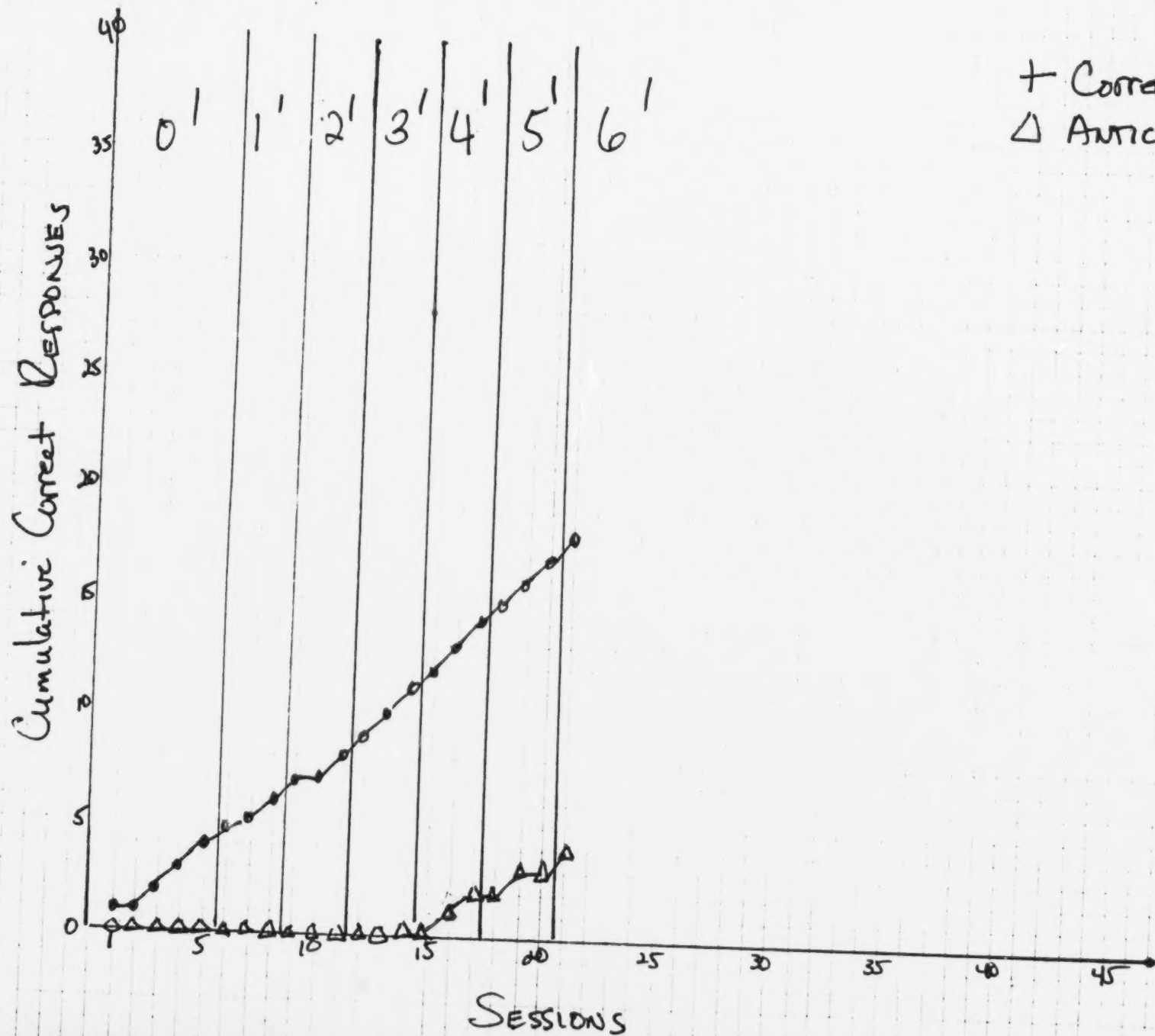
Using the Interrupted Behavior Chain

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Train within as many of the 4 routines as possible each day.

Record performance in at least one context.

	<u>Date</u>	<u>Routine</u>	<u>Delay</u>	<u>+/-</u>
	11/2	snacktime	0	+
	11/3	cafeteria	0	-
	11/4	arcade game	0	+
	11/5	recorder	0	+
	11/6	snacktime	0	+
	11/9	cafeteria	1	+
	11/10	arcade game	1	+
	11/11	recorder	1	+
	11/12	snacktime	2	+
	11/13	arcade game	2	-
	11/16	recorder	2	+
	11/17	cafeteria	2	+
	11/18	arcade game	3	+
	11/19	snacktime	3	+
	11/20	cafeteria	3	+
	11/23	recorder	4	+
	11/24	snacktime	4	Δ
	11/25	cafeteria	4	Δ
	11/30	arcade game	5	+
Probe	2/1	recorder	5	Δ
	2/2	recorder	5	+
Probe	2/3	snacktime	6	Δ



REFERENCES

- Alwell, M., Hunt, P., Goetz, L., & Sailor, W. (1987). Using an interrupted behavior chain strategy to teach generalized and spontaneous communication response to learners with severe disabilities. Manuscript in preparation.
- Bates, E., Camaioni, L., & Volterra, V. (1975). The acquisition of performatives prior to speech. Merrill-Palmer Quarterly, 21(3), 205-226.
- Bruner, J. (1974). The organization of early skilled action. In M. P. M. Richards (Ed.), The integration of a child into a social world. London: Cambridge University Press.
- Bruner, J. (1975). The ontogenesis of speech acts. Journal of Child Language, 2, 1-20.
- Bruner, J. (1978). From communication to language: A psychological perspective. In I. Markova (Ed.), The social context of language. Chichester: John Wiley & Sons.
- Carr, E., Binkoff, J., Kologinsky, E., & Eddy, M. (1978). Acquisition of sign language by autistic children. Journal of Applied Behavior Analysis, 11, 489-502.
- Carr, E. G., & Kologinsky, E. (1983). Acquisition of sign language by autistic children II: Spontaneity and generalization effects. Journal of Applied Behavior Analysis. 16(3), 297-314.
- Casey, L. O. (1978). Development of communicative behavior in autistic children: A parent program using manual signs. Journal of Autism and Childhood Schizophrenia, 8(1), 45-59.

- Fay, W. H., & Schuler, A. L. (1980). Emerging language in autistic children. Baltimore: University Park Press.
- Ford, A., & Mirenda, P. (1984). Community instruction: A natural cues and correction decision model. Journal of the Association for Persons with Severe Handicaps, 9(2), 79-87.
- Goetz, L., Gee, K., & Sailor, W. (1985). Using a behavior chain interruption strategy to teach communication skills to students with severe disabilities. Journal of the Association for Persons with Severe Handicaps, 10(1), 21-30.
- Goetz, L., Schuler, A., & Sailor, W. (1979). Teaching functional speech to the severely handicapped: Current issues. Journal of Autism and Developmental Disabilities, 9, 325-343.
- Goetz, L., Schuler, A., & Sailor, W. (1981). Functional competence as a factor in communication instruction. Exception Education Quarterly, 2, 51-60.
- Goetz, L., Schuler, A., & Sailor, W. (1983). Motivational considerations in teaching language to severely handicapped students. In M. Hersen, V. Van Hasselt, & J. Matson (Eds.), Behavior theory for the developmentally and physically disabled. New York: Academic Press.
- Guess, D., Keogh, W., & Sailor, W. (1978). Generalization of speech and language behavior: Measurement and training tactics. In R. L. Schiefelbusch (Ed.), Bases of language intervention. Baltimore: University Park Press.

- Guess, D., Sailor, W., & Baer, D. M. (1974). To teach language to retarded children. In R. Schiefelbusch & L. Lloyd (Eds.), Language perspectives: Acquisition, retardation, and intervention. Baltimore: University Park Press.
- Hall, G., Sundberg, M., & Stafford, M. (1979). Teaching a mand repertoire to deaf individuals: Transfer of stimulus control from imitative or tact variables to the establishing operation. Paper presented at the 5th Annual Association for Behavior Analysis Conferences, Dearborn, MI.
- Halle, J. (1987). Teaching language in the natural environment: An analysis of spontaneity. Journal of the Association for Persons with Severe Handicaps, 12(1), 28-37.
- Halle, J. W., Marshall, A. M., & Spradlin, J. (1979). Time delay: A technique to increase language use and facilitate generalization in retarded children. Journal of Applied Behavior Analysis, 12, 431-439.
- Halliday, M. A. K. (1975). Learning how to mean: Explorations in the development of language. London: Edward Arnold.
- Harris, S. (1975). Teaching language to nonverbal children with emphasis on problems of generalization. Psychological Bulletin, 82, 565-580.
- Hart, B., & Risley, T. (1968). Establishing use of descriptive adjectives in the spontaneous speech of disadvantaged preschool children. Journal of Applied Behavior Analysis, 1, 109-120.

- Horner, R. H., & Budd, C. M. (1985, March). Acquisition of manual sign use: Collateral reduction of maladaptive behavior, and factors limiting generalization. Education and Training of the Mentally Retarded, pp. 39-47.
- Horner, R. H., Bellamy, G. T., & Colvin, G. T. (1984). Responding in the presence of nontrained stimuli: Implications of generalization error patterns. Journal of the Association for Persons with Severe Handicaps, 9(4), 287-295.
- Hunt, P., Goetz, L., Alwell, M., & Sailor, W. (1985). An analysis of the relative effectiveness of self-initiated versus instructed chains for use as instructional contexts. Unpublished manuscript. San Francisco State University, Communication and Motivation Research Project.
- Hunt, P., Goetz, L., Alwell, M., & Sailor, W. (1986). Using an interrupted behavior chain strategy to teach generalized communication responses to students with severe disabilities. Journal of the Association for Persons with Severe Handicaps, 11(3). 196-204.
- Koegel, R., & Williams, J. (1980). Direct vs. indirect response-reinforcer relationships in teaching autistic children. Journal of Abnormal Child Psychology, 8, 537-547.
- LaVigna, G. (1977). Communication training with mute autistic adolescents using the written word. Journal of Autism and Childhood Schizophrenia, 7, 135-149.

- Lewis, M. (1985). Developmental principles and their implications for at-risk and handicapped infants. In M. Hanson (Ed.), Atypical infant development. Austin, TX: PRO-ED.
- Litt, M. D., & Schreibman, L. (1982). Stimulus-specific reinforcement in the acquisition of receptive labels by autistic children. Journal of Analysis and Intervention in Developmental Disabilities, 1, 171-186.
- Lock, A. (1978). Action, gesture, and symbol: The emergence of language. New York: Academic Press.
- Piaget, J. (1951). Play, dreams, and imitation in childhood (C. Gattegno & F. M. Hodgson, Trans.). N.Y.: W. W. Norton Co., Inc.
- Reichle, J., & Brown, L. (1986). Teaching the use of a multipage direct selection communication board to an adult with autism. Journal of the Association for Persons with Severe Handicaps, 11(1), 68-73.
- Sailor, W., Goetz, L., Anderson, J., Hunt, P., & Gee, K. (1987). Integrated community intensive instruction: Research and theory. In R. Horner, G. Dunlap, & R. Koegel (Eds.), Generalization and maintenance in applied settings. Baltimore: Paul Brookes.
- Saunders, R., & Sailor, W. (1979). A comparison of three strategies of reinforcement on two-choice learning problems with severely retarded children. AAESPH Review, 4, 323-333.

- Schuler, A. (1987). The role of social interaction in the development of thinking skills. Focus on Exceptional Children. 19(7), 1-11.
- Schuler, L., & Goetz, L. (1981). Assessment of severe language disabilities: Communicative and cognitive considerations. Analysis and Intervention in Developmental Disabilities, 1, 333-346.
- Stafford, M., Sundberg, M., & Braam, S. (1978, April). An experimental analysis of mands and tacts. Paper presented at the fourth annual convention of the Midwest Association of Behavior Analysis.
- Stokes, T., & Baer, D. (1977). An implicit technology of generalization. Journal of Applied Behavior Analysis, 10, 249-267.